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ABSTRACT

This qualitative study focused on the theories and practices of two electronics instructors at a small, rural technical college, one with formal teacher education in vocational education and one with no formal teacher training. The instructors completed survey instruments to determine their theoretical frameworks. This included the Cognitive Interest Inventory, which provided a means of identifying beliefs for analysis using the theory of knowledge-constitutive interests, and the Educational Philosophy Inventory, which measured their beliefs about essentialism, behaviorism, progressivism, existentialism, perennialism, and reconstructionism. The researcher interviewed the instructors and their students, observed their classes, and reviewed the college catalog. Both instructors revealed a good match between espoused theories and their teaching practices. The two instructors were primarily technical in both their theories and practices relative to their current jobs. The most striking difference found was that one instructor seemed more student-centered, and the other instructor seemed more subject-centered. The paper examines and discusses the impact of teacher training based on the study findings. (SM)

RUNNING HEAD: Theory and Practice in a Technical College

Theory as Espoused and Practiced in a Technical College

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Abstract

This qualitative study, entitled, "Theory as Espoused and Practiced in a Technical College," focused on the theories and practices of two electronics instructors, one with formal teacher training and the other with none. The instructors completed survey instruments to determine their theoretical frameworks. The researcher then interviewed them and their students, observed their classes, and reviewed the college catalog. Both instructors revealed a good match between espoused theories and their teaching practices. The most interesting difference found was that one seemed more student-centered; the other, more subject-centered. The impact of teacher training is examined and discussed based on the findings.

Theory as Espoused and Practiced in a Technical College

Introduction

Do educators "practice what they preach"? One of the purposes of educational theory is to guide instructional practices. Conversely, practices and the results observed from them influence educational theory both within an individual and among an educational community. Without close attention to and reflection on how theory and practice interact, however, educators may develop gaps between their theories and their practices. This paper reports the findings of a project aimed at not only comparing the theories and teaching practices of individual instructors but also gaining insights into the sources of those theories and practices.

Purpose and Setting

The primary purpose of this research project was to discover how theory and practice interact in the work of two instructors at a small, rural technical college in the south. The two instructors selected to participate differed in their professional preparation: One earned a bachelor's degree in vocational education while the other had no formal training as an instructor. The setting was one of the approximately 30 public two-year colleges known as the Alabama College System. This system is administered by the Alabama State Board of Education, the same body that administers state K-12 school systems. Each college in the system has a president who reports to the Chancellor of the Alabama Department of Postsecondary Education. The Chancellor reports directly to the State Board of Education. The technical college selected as the site for this project (hereafter referred to as "the College") has an enrollment of approximately 1,000 students, with about 50 percent located on the main campus in a town of population 16,000. The College offers 16 technical programs, which are organized into five instructional clusters–business systems technology, construction technology, electrical/electronics technology, personal services (nursing and cosmetology), and mechanical technology. The courses and programs of study are designed as terminal associate's degree or technical diploma/certificate programs with the objective of placing students in the workforce rather than transferring them to four-year colleges and universities. The College has an "open admissions" policy, the only

requirement being that students must be at least 16 years of age and must demonstrate their ability to benefit from the instruction provided. Certain programs of study, however, also require a high school diploma or GED. This additional requirement applies mainly to programs that award the Associate in Applied Technology degree, not to the diploma and certificate programs, which tend to be shorter in duration.

The two instructors participating in this project, who will be referred to using pseudonyms, both teach in the electrical/electronics cluster, in which all programs offer the associate's degree. Thus, these instructors teach some of the more high-achieving students at the College. In technical education, many instructors are employed based on their technical skills, not their educational credentials. Although the pay scale is higher for those who hold advanced degrees either in education or in their fields of instruction, some technical instructors do not even hold a technical certificate. They are required only to demonstrate expertise in the field they are employed to teach. Both instructors in this study have earned associate's degrees in their fields. The electrical technology instructor, "Instructor Brown," has also earned a bachelor's degree in vocational education. The electronics instructor, "Instructor Adams," is currently pursuing a bachelor's degree, but his degree will be in technology management rather than education. Both instructors worked as technicians in their fields before becoming instructors.

The Alabama College System recently converted from the quarter system to the semester system. Previously, each college in the system had its own set of programs and courses, but as all colleges converted to semesters, teams of instructors from every college worked together to develop a common inventory of courses from which each institution can choose. Thus, at the time of this study, the instructors who participated were in the midst of major curriculum revisions.

Data Collection

There were six sources of information used for this study: interviews of each instructor, observations of classroom teaching, interviews of students, and a review of both the quarter-system 1997-98 College Catalog and the revamped semester-system 1998-99 College Catalog.

Each instructor also completed both the Cognitive Interest Inventory and the Educational Philosophy Inventory. The Cognitive Interest Inventory (Butler, 1997) is a five-point likert scale on which participants are asked whether they agree or disagree with statements regarding the general aims and practices of education. It provided a means of identifying beliefs for analysis using the theory of "knowledge-constitutive interests" originally developed by Jurgen Habermas, as interpreted by Shirley Grundy (1987). The three interests are technical, practical, and emancipatory, which Grundy defines as follows:

> Technical: "a fundamental interest in controlling the environment through rule-following action based upon empirically grounded laws" (p. 12).
>
> Practical: "a fundamental interest in understanding the environment through interaction based upon a consensual interpretation of meaning" (p. 14).
>
> Emancipatory: "a fundamental interest in emancipation and empowerment to engage in autonomous action arising out of authentic, critical insight into the social construction of human society" (p. 19).

The alpha coefficient for internal consistency within each category is technical, .8187; practical, .7538; and emancipatory, .8358 (Butler, 1997).

The Educational Philosophy Inventory is another five-point likert scale that was used to measure the extent to which the participants agree with statements reflecting one of six basic philosophies: essentialism, behaviorism, progressivism, existentialism, perennialism, and reconstructionism. It is an unpublished survey developed by unnamed authors at the University of West Georgia. There are no reliability data available regarding this instrument. I used these inventories in an exploratory manner to help frame my starter questions for the instructor and student interviews.

Instructor interviews began with the following open-ended questions:

1. What is your philosophy of teaching?
2. How do you motivate students?
3. How much control do you have over your curriculum?
4. How much control do you have over your instructional methods?

5. How do you go about teaching a new concept?
6. Do you believe that anyone can learn electrical/electronics technology?
7. How did you learn to teach?
8. What makes an effective instructor?
9. How should instructors be evaluated?
10. How should students be evaluated?
11. What are the biggest problems you face as an instructor?

I then asked other questions that arose during the interviews, either for the sake of clarity or to pursue an interesting comment made by the interviewee.

Similarly, the interviews of the students in the observed classes also began with a list of starter questions:

1. What kind of teacher is Mr. Adams/Brown? How would you describe him to someone who doesn't know him?
2. Now that you have completed the classroom part of today's class, what do you expect will happen when you move into the lab for the hands-on application of what you have learned?
3. When do you learn the most–in the classroom or in the lab?
4. How are you evaluated in this class?
5. Who decides what you learn in this class?
6. Who decides how you learn in this class?

Based on student responses, I also asked other questions of the students to gain a better sense of how each instructor's theories are applied in his classroom.

Data Analysis

Prior to conducting the rest of my research, I scored the two instruments used, the Cognitive Interest Inventory and the Educational Philosophy Inventory. After collecting the other data, I then used content analysis of interviews and observations to identify data suggesting technical, practical, or emancipatory interests. I reviewed the tapes of the instructor and student interviews, transcribing statements that appeared to relate to one of the three categories or that described specific practices or theoretical frameworks. The college catalogs and field notes from classroom observations were analyzed in a similar manner. To assist in data analysis, I organized evidence suggesting each of the three cognitive interests into Tables 1, 2, and 3.

Findings: Instructor Brown

Instructor Brown prepared for his teaching career by earning a bachelor's degree in vocational education. His coursework included what he referred to as the "Holy Four" teaching methods courses, in which he learned a highly technical approach to instruction. The specifics of this approach that he mentioned in his interview included four steps to building an effective lesson: providing an explanation, demonstrating through concrete examples, providing a question-and-answer session, and then moving on to the next subject. He regards tests as "checkpoints" to evaluate both the instructor's teaching and the student's learning.

During his classroom observation, Instructor Brown covered some specific functions of programmable logic controllers (PLCs). He provided handouts at the beginning of the class, so the students were able to follow along and answer his questions as he went through the commands and how they are used. Several times during the class, he would bring into the discussion specific examples from the students' current jobs and from their previous lab work. As he neared the end of the lesson, at least one student took out a diagram of a program he was working on and began making corrections to it. Based on what Instructor Brown had just explained, he was improving the design of his project and therefore also constructing knowledge.

In the interview of Brown's students, they referred to him as a "one-of-a-kind" instructor because he makes learning fun and relates it to real life. They also respect him because he is "very involved with his students," staying nearby as they complete independent projects and being able to sense when they are having problems with the material. It appears that Instructor Brown is a highly skilled practitioner of the technical interest, with just a touch of a practical approach to help relate knowledge to students' interests and their futures in the real world.

The results of the Educational Philosophy Inventory showed Brown's primary philosophy to be existential. This philosophy advocates individual choice and self-awareness. His second highest score was for progressivism, which also emphasizes the student and his or her individual interests over the subject matter being taught. On the Cognitive Interest Inventory, his scores for the technical and practical interests differed by only one point, with his emancipatory score being

much lower. In the interview, Brown confirmed his technical views by identifying the instructor and the institution as being in control of the learning process. He also referred to objectives and sequencing as "stepping stones." His practical interests and existential-progressive philosophies were also evident, however, as he talked about finding his students' interests and relating his courses to "real-life experience." He favors an "open classroom setting where everybody participates" and acknowledged that "when you walk into that classroom, you're not the only teacher in there." In discussing the semester conversion process, he expressed frustration with members of the curriculum committee who "wanted to go with ABCs" rather than simply agreeing on the overriding principles that would allow the local instructor to adjust his or her curriculum to meet the students' and local industries' needs. Brown also discussed the need for students to gain a deep understanding of basic electrical concepts so that they can then apply this knowledge in a variety of circumstances.

Findings: Instructor Adams

When he was hired to teach electronics, Instructor Adams prepared himself by reviewing the subjects on which he was weak. Having no formal teacher training, he bases his teaching practices on role models with whom he has worked. These role models come not from education but from industry. His approach to teaching is to motivate the students through "achievable challenges." As an example, he described his exams, on which the average grade is an F. "It doesn't do me any good to give you a test you can pass. I need to know where you're weak," he commented in the interview. On each test he gives, there is a "question eight," which he describes as "MIT level," referring to the academically elite Massachusetts Institute of Technology. On the day of his classroom observation, question eight was an example from Adams' former job at NASA, in which the students were asked to compute the altitude of the space shuttle using only its velocity. He reported that none of his students have ever figured out this problem, but that several have come close and that their calculations as they try to solve it give him much insight into their reasoning processes. During the class, he explained how question eight was workable by drawing a diagram and combining three different formulas. It

took approximately twenty minutes for him to explain this process, but the students seemed to follow his reasoning. As he came moved from step to step in solving the problem, he would call on different students to supply a formula or a calculation. Some of them wrote down the solution while others did not.

The only other objective for the class observed was to "highlight the rest of the quarter." As Adams went through the chapter names and numbers remaining and as he went over the test question, he also threw in other comments and stories. He directed some of these comments toward me, so my presence may have significantly affected what he did in his class that day. It seemed that during the interview, which was conducted earlier on the same day, he had reminded himself of some things he wanted to tell his students. For example, in the interview he told me an anecdote about an electronics graduate from another two-year college in Alabama who was paid $1 million to build a machine for Russia, and he then shared this story with his students. Adams also passed around a comical page of computer-altered pictures showing the other electronics instructor ("Clark") with several different "looks," such as punk rock and country-western hairstyles.

In the interview with Adams' students after the class, they described him as "hyper," highly intelligent, and experienced, with a good sense of humor. They said he gives them the information they need to complete lab projects, but they have to think through how to complete these on their own. They regard his tests as confusing, but they think the way he tests will probably help them be able to solve problems in the future. They prefer lab projects to tests because (1) they can get help during labs and (2) they can think better about the labs because "it's right there in front of you, and you can tell if it's going to work or not." They did feel that Adams varies the pace of instruction depending on how well the students understand the material.

However, I received some differing insights on students' perceptions of Adams when I interviewed the students in Instructor Brown's class. Brown's class had only about 10 students, and once the tape-recorder was turned off, I asked how many of them were also in the physics class I was planning to observe that afternoon. Many of them were, and they spontaneously

began to talk about Adams in comparison to Brown. In this environment, they said much more negative things about Adams than those heard in the larger physics class of approximately 30 students. It seemed that the discussion in the physics class was dominated by some students who were "Adams fans" (perhaps students in his program rather than in Instructor Brown's), so Brown's electrical technology students did not share their honest opinions of Adams during the formal, large-group interview. The things they said off the record were that Adams "goes too fast" and confuses them rather than teaching them. They said he teaches "over their heads" and that he will not stop or slow down when they are confused. They felt he is very knowledgeable, but "it takes four quarters just to learn his teaching method." They seemed to think the fact that he showed them more than one way to solve a problem confuses them even more, and they also complained that there were too many people in his class and not enough textbooks.

On the Educational Philosophy Inventory, Instructor Adams scored highest for a progressive educational philosophy, with essentialism being his secondary philosophy. These results showed a conflict because the two philosophies are somewhat antithetical. Progressivism emphasizes the student and his or her individual interests over the subject matter being taught, whereas essentialism takes a "back to basics" approach that emphasizes facts, skills, discipline, and respect for authority. On the Cognitive Interest Inventory, his scores for the technical and practical interests differed by only two points, with his emancipatory score being much lower. Adams' practical interests were evident in his interview as he emphasized understanding the environment in order to interact with it. He wanted his students to use their powers of reasoning to take appropriate action, and when that action did not produce the desired result, he wanted them to reflect to discover how best to correct the problem. His technical interests and essentialist philosophy were evident in his mention of following rules, meeting and exceeding standards, and adjusting the curriculum to meet the needs of industry rather than of the students.

The Context of the College

The curriculum being practiced by these instructors is largely under their control. Although the semester conversion has yielded a system-wide course inventory, both instructors

were involved in the development of this inventory as they served on committees with other instructors throughout the system. Even with the inventory in place, they have the power to choose which courses should be included in their local programs, and they also determine how learning is accomplished. Local industries have significant input into curriculum development, both informally through employers' requests for trained graduates and formally through program Craft Committees, which meet twice a year to review the design, implementation, and equipment used in each technical program. It is the instructor's responsibility to seek and to use this industrial input, and both instructors interviewed are quite willing to incorporate local industrial needs because it helps their students to find jobs upon graduation. In addition, there have been occasions when mandates on curriculum have come down from the local College administration. For example, a few years ago the College president heard from an industry representative that a graduate of the College had asked him, as a potential employer, how to do a resume, which humiliated the president. Therefore, the instructors are now required to sign a statement that they will teach job-search skills as part of their instructional programs.

Aside from such rare college-wide mandates, the instructors at the College are largely emancipated. Their students are also somewhat emancipated in that students choose (1) whether to enroll at all and (2) which programs they study. They also have limited options within these programs through course listings such as independent study, cooperative education, and "special projects." Despite these examples, however, the College environment is extremely technical. Instructor Adams commented that the meetings he attends on campus are very directive, ordering the instructors to do a better job of non-teaching tasks such as documenting their professional development, contacting local industries, or recruiting new students. Coming from industry to education within the past four years, he sees a drastic difference in such examples of what he calls "administration" as compared to "management." In management, he said, meetings are held to gain input and to make team-level decisions, not to remind people to do their jobs. Like the College's administration, the system-wide course inventory (and therefore the College Catalog) is also very technical, spelling out what each course "covers" and ending with statements such

as, "Upon completion, the student should be able to develop programs, load programs into PLCs, and troubleshoot the system."

An interesting aspect of the students' perception of the college context arose during both student interviews. When asked, "Who decides what you learn?" the students consistently answered, "We do." This response was unexpected given the overwhelming evidence that instructors control the curriculum, but the students are fully aware that regardless of the curriculum or the instructor, they decide what they learn by the amount of work they are willing to do. This response is a reminder that regardless of the curriculum theory being practiced–even the technical, with its emphasis on controlling the learning process–it is the students who ultimately control whether they participate in learning. Even though this question failed to achieve its purpose, which was to see whom students view as the keeper of the curriculum, it did reveal an important component in the relationship between curriculum theory and practice: the students. When I rephrased the question and asked, "Who decides what is taught?" I received the answer I sought in order to confirm the practice of the technical interest: The students replied, "He does," referring to their instructor.

Instructor	Technical	Practical	Emancipatory
Brown	Score of 63 on Cognitive Interest Inventory "Accomplish objectives." "Catalog provides stepping stones." "Can't leave a student behind." "Holy Four" teaching methods courses: *Explain *Show using media and math *Question and answer *Move on to next subject Tests are checkpoints to evaluate instructor's teaching and student's motivation. "It would behoove you to take notes."	High progressivism score on Educational Philosophy Inventory Score of 64 on Cognitive Interest Inventory "Find your students' interests." "Relate to real-life experience." Students can "apply basic principles anywhere they go." "Some [on semester curriculum team] wanted to go with ABCs, steps to learn, . . . fixed curriculum." (He did not.) "When you walk into that classroom, you're not the only teacher in there." "Open classroom setting where everybody participates, and the best classroom situation is where they do that." Hands-on labs for full understanding Instructors and students should be evaluated on the students' ability to "survive" in the workplace. "I'm here for the students."	High existentialism score on Educational Philosophy Inventory

Table 1. Evidence of Instructor Brown's Cognitive Interests.

Instructor	Technical	Practical	Emancipatory
Adams	High essentialism score on Educational Philosophy Inventory Score of 54 on Cognitive Interest Inventory "I'm trying to have them reach a plateau." Motivates by "achievable challenges," and he sets challenges: lab projects, tests, etc. "By the end of the class, we've gone through semiconductor curves, we've studied curves, we've done diode junction capacitors, and we've done oscillators. Wow! We have really made it through 'Solid State.'" "Solid State is the toughest class in the curriculum, and 'Old Man [Adams]' is teaching it. Well, it wouldn't matter if [Brown or Clark] were teaching it, it's still a hard class. . . . The standards are the same." "If you follow these rules, you will get this result." "It doesn't do me any good to give you a test you can pass. I need to know where you're weak." Prepared to begin teaching career by reviewing subject matter on which he was weak.	High progressivism score on Educational Philosophy Inventory Score of 56 on Cognitive Interest Inventory "It's important that students understand the underlying reasons for technology." Emphasizes analytical powers and ability to reason in order to create a result or take appropriate action. "Once you learn this, your whole life is changed. You no longer look at anything the way you did before. . . . You have got to become a technologist and open yourself up to anything." "When they finish, I feel confident they can assess other items I haven't been able to cover. . . . They can reason through that." The students "have to ask 'Why didn't I fix this problem?' and be boldlyc honest with themselves." "If you can't teach a student to think about technology, then you haven't achieved your goal. . . . Anybody can teach anything about technology, but if the students don't understand why it runs the way it does and how you can affect its performance, then you can't solve any problems."	Student options are built into his program (on a limited basis). "They learn to criticize themselves." However, very little regard for justice and equity.

Table 2. Evidence of Instructor Adams' Cognitive Interests.

Instructor	Technical	Practical	Emancipatory
Adams (continued)	Bases his teaching on role models with whom he worked in industry. Wants more time to learn new technology. Pursuing degree in technology management, which he describes as "controlling the environment to achieve goals." Would rather be pursuing degree in Computer Science and Engineering to become more of a subject-matter expert and "to build hybrid computers." Wants students to "be the best." Curriculum is based on industry needs: certification tests, craft committees, job requests.	Starts with understanding, then application, then 1-2-3 process. "What generally happens is students are told if you do this, that, and the other, it will happen this way. But then you have the real world setting in there, and 'Oh, we forgot to tell you about this and this.' That's why you have to teach the ability to think." "The more they start around the edges and bring it into the center, instead of starting at the center and going out, the better they can create these labs that will really work." "If it doesn't work, they're not shaken. They analyze what went wrong. . . . They go back and approach it again, and more than likely, it works. That's my job, to help them focus on the errors they might have." "I really consider my students technicians by their third quarter." (Last-quarter students are "managers" of other students on group projects.) Grades half on tests and half on participation, motivation, attendance. The average test grade is F. Sees difference between "Educational Administration" and "Management of Resources" (empowering people) and between "training" and "education."	

Table 2. Evidence of Instructor Adams' Cognitive Interests (continued).

Instructor	Technical	Practical	Emancipatory
Curriculum/ College	Based on system-wide course inventory and industry needs. Course descriptions are written in terms of behavioral objectives. Mandates come from president and dean of Instruction when problems are identified (e.g., poor job search skills). Bureaucracy and documentation Emphasis is on preparing students to meet industry needs. Evaluation of programs and instructors is based on graduation rates, entrance and exit exam scores, placement rates, instructor observations, student and employer surveys.	Lab classes, cooperative education, industry contacts	Students choose to attend and which program to pursue. They have some choices within their programs of study. BUT No counseling services help students choose a particular program. Instructional decisions reside with instructors.

Table 3. Evidence of the College's Cognitive Interests.

Discussion

The context in which this study took place is highly technical not only because of the administration of the College itself, but also because of the nature of the courses being taught. In a "technical college," the goal is not the fostering of democracy or individualism: the goal is the transfer of skills related to a specific occupation. Thus, despite being somewhat interested in building practical understanding, both instructors were primarily technical in both their theories and practices relative to their current jobs. In the classes observed, there was little student interaction. Both instructors began their classes by telling the students what they were going to do that day, and both did most of the talking as the class went on. There was a difference, however, in what the students did in each of their classes. Adams' students sat fairly inactive, struggling to follow the "challenge" provided by their instructor. Brown's students, on the other hand, were calmly engaged in the lesson, taking notes and applying what was happening in class

to their independent projects. What made the difference in how the students responded to these two instructors? Was it teacher preparation?

From the outset, the my hypothesis was that there would be little difference between these two instructors--in other words, that teacher education would have no great significance. The two subjects echoed this belief when they were approached about their participation in the project. "You won't see any difference," one of them predicted. I, however, did expect a minor difference in the language used by the instructors in that I predicted the one with no formal teacher training would not use the educational jargon promulgated by teacher education programs and educational theorists. Nevertheless, analysis did reveal a more prominent difference that may be attributed to the differing educational backgrounds of these instructors. Furthermore, this difference seems to be a factor in the interplay between the espoused theory and the actual practices of the instructor with no formal teacher training.

For Instructors Adams and Brown, there is a good match between espoused theories and practices. Both have a technical/practical interest, and they respond to their extremely technical environment by focusing on the technical and incorporating the practical when they can through real-world examples and hands-on laboratory assignments. The difference between Adams and Brown is that the former is more subject-centered and the latter, more student-centered. Brown seems to make his classes, which are technology-intensive and therefore potentially difficult, easy for his students by applying the methods learned in his "Holy Four" teaching methods courses. His observed presentation was very organized and logical, so that even I, as someone ignorant of basic electronics principles, had a firm grasp of the material by the time he finished. He expressed his concern for the students during his interview, and the students were certain that he truly does care for them.

Adams, on the other hand, shows great enthusiasm for the subject he teaches. He wants to learn more about his field; but mentioned no desire to learn more about how better to meet his students' needs. Although he did express concern for them to "be the best" and "earn big bucks" and even mentioned wanting to build their self-confidence, he spent much more time discussing

all the wonderful high-tech projects they are completing. He seemed to have great intentions, but there is a strong possibility that his lack of teacher training causes him to fall short of seeing things from the students' perspectives. Thus, they feel confused and frustrated.

Of course, the ultimate measure of success is the students' learning, not their emotions or opinions regarding their instructors. It could be that although Adams elicits negative student reactions, he is actually more successful in the practical arena because he gives the students the freedom to construct their own knowledge as they try (and sometimes fail) to meet his challenges. In both classes, the students appeared to be developing a sound understanding of some very complicated concepts. No data was collected, however, to confirm this observation.

Conclusion

In short, the two instructors observed were technical/practical individuals operating in more technical manners as a result of being in a highly technical environment. If they were teaching courses more academic in nature, then they might focus more on practical interests. In their jobs, however, a technical approach is required, but their more practical techniques make learning more meaningful for their students. By branching out into the practical, they seem to be going beyond their job descriptions for the sole reason of serving the interests of their students and their students' future employers. These efforts are commendable and seem to be appreciated more by the students than by the existing powers within the College.

Beyond the academic exercise of comparing espoused theory and practice, perhaps the most meaningful conclusion from this study is the possibility of a relationship between teacher training and subject- or student-centeredness. Further research in to this relationship could confirm, or elaborate on, the hypothesis that formal teacher education helps instructors to be more cognizant of their students' needs as well as to be more capable of meeting these needs. Perhaps if Adams were to seek teacher education, he would gain the theoretical background needed to vary and refine his teaching practices, using a "Holy Four"-type technical approach when needed to guide students through difficult new material and then moving on to the practical once they are ready to apply what they are learning.

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